Section 5 Disassembly and Assembly

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The procedures in this section tell how to remove, replace and install the major components in the instrument.

Before You Begin

Removing, replacing and installing the major components should be done by qualified service personnel.

Warnings and Caution

WARNING

- **To avoid the possibility of injury to yourself or damage to the instrument, do not install or remove any component or change the internal switch settings while the power is on. After the power is off, wait a few minutes before disassembling the instrument.**
- **To avoid accidental discharge of static electricity, which could damage the instrument components, use a wrist ground strap when installing or removing any component.**

CAUTION

Fuses cut off the power when an abnormality occurs in the instrument. Eliminate the malfunction before replacing the fuse. Use the correct fuse only. The fuse rating is shown on the holder.

Required Tools

Anti-static bench mat
Anti-static wrist strap
Flat-blade screwdriver (insulated type)
Phillips screwdriver (insulated type)
Allen wrench or hexagon keys
Hex socket driver
Tweezers
Nippers
Cable binder

Opening the Instrument

1. Turn off the instrument.

2. Disconnect the power cord from the instrument and remove the battery from the instrument.

3. Remove the rubber cap from each end of the handle by popping the cap out with a flat-blade screwdriver. A hexagonal head screw is under each cap.

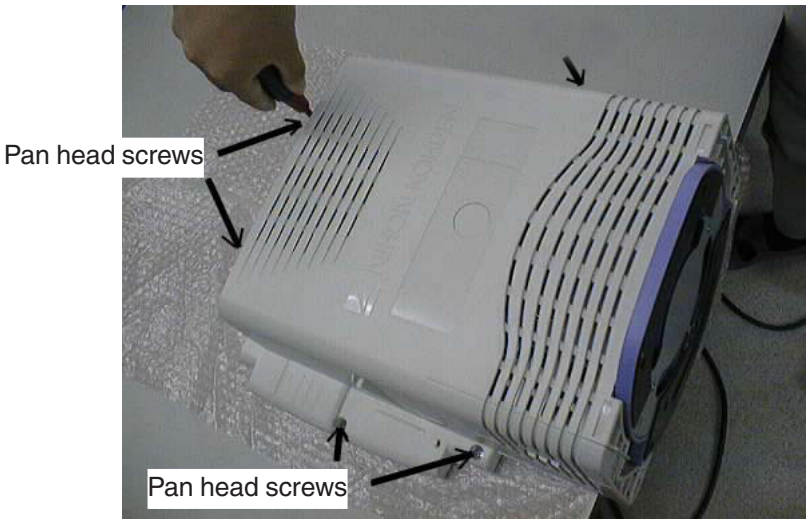
4. Use a 5 mm Allen wrench to remove the 2 hexagonal head screws which secure the handle. Remove it from the instrument.

CAUTION

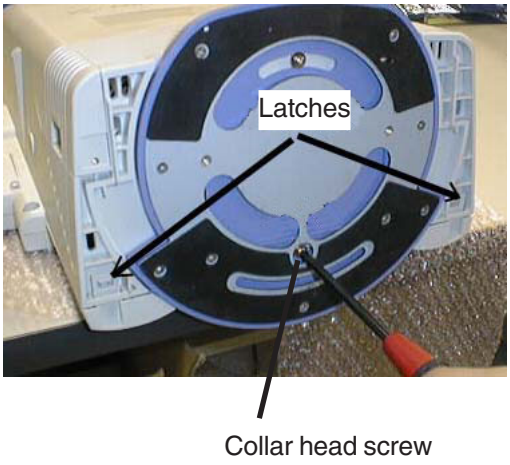
Before placing the instrument on a table, if its surface is dirty, hard or rough, cover the table with a clean, soft and smooth material to avoid making the screen dirty or damaging the screen.

5. Put the instrument on the work table so that the rear side is up and the bottom part of the instrument extends beyond the table edge.

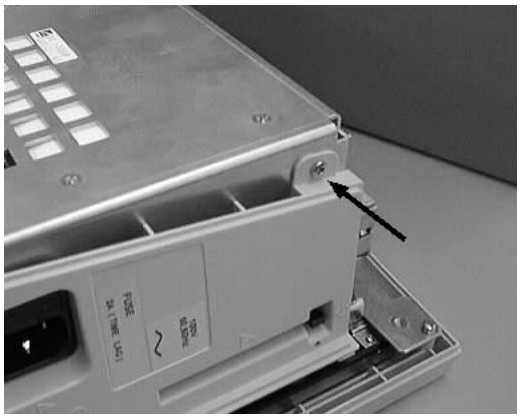
6. Remove the 5 pan head screws from the rear enclosure.



7. Remove the collar head screw with spacer from the bottom of the instrument. Release the latches on the bottom corners of the instrument and slowly and carefully lift the rear enclosure to open the instrument and expose the chassis block.



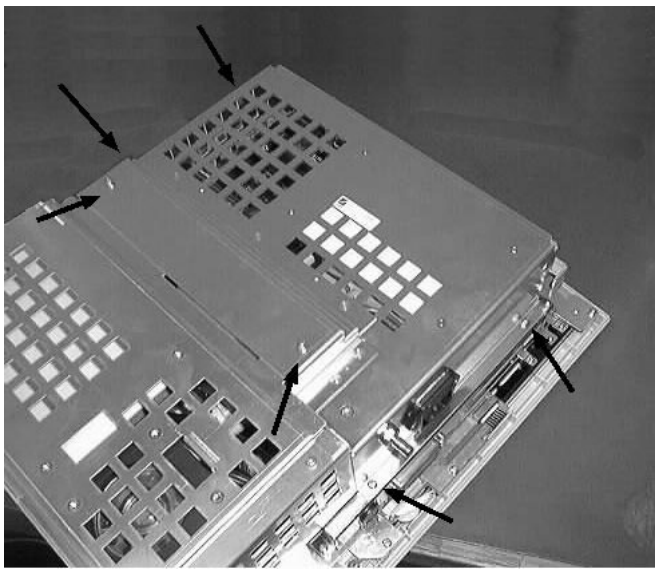
8. Remove the binding head screw which secures the side panel to the upper chassis (power chassis) cover. Remove the side panel from the instrument. 2 screws are visible under the side panel.



NOTE in Assembling the Instrument

Check that the binding head screw which was removed in step 8 is used to secure the side panel.
The binding head is slightly bigger than a pan head so more torque can be applied to the side panel with the binding head screw.

9. Remove the 6 screws which secure the upper chassis cover.



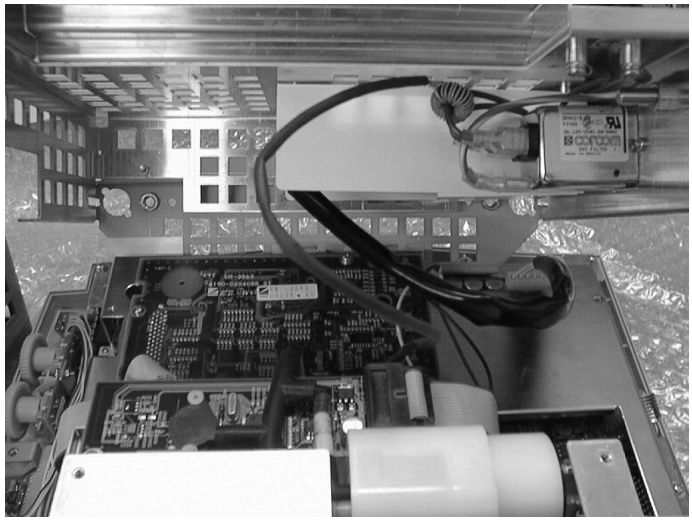
10. Carefully lift the upper chassis cover up and disconnect the following cables from the specified sockets. Remove the upper chassis cover.
    - Disconnect the cable between the power supply unit and MAIN board from CN105 socket on the MAIN board.
    - Disconnect the cable between the AC inlet socket and DPU board from CNJ031 socket on the DPU board. This cable has a toroidal core for line frequency detection.

CAUTION

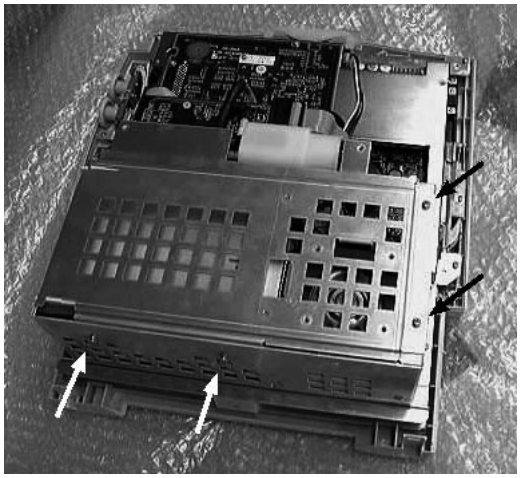
Pull the connector housing to disconnect the cable. If the cable is pulled, the wires inside the cable can be cut near the connector.

NOTE in Assembling the Instrument

Make a note of how the cables are arranged in the instrument.



11. Remove the 4 screws which secure the lower chassis cover as shown below. Carefully lift it up and disconnect the cable between the battery receptacle terminal and MAIN board from CN021 on the MAIN board. Remove the lower chassis cover.

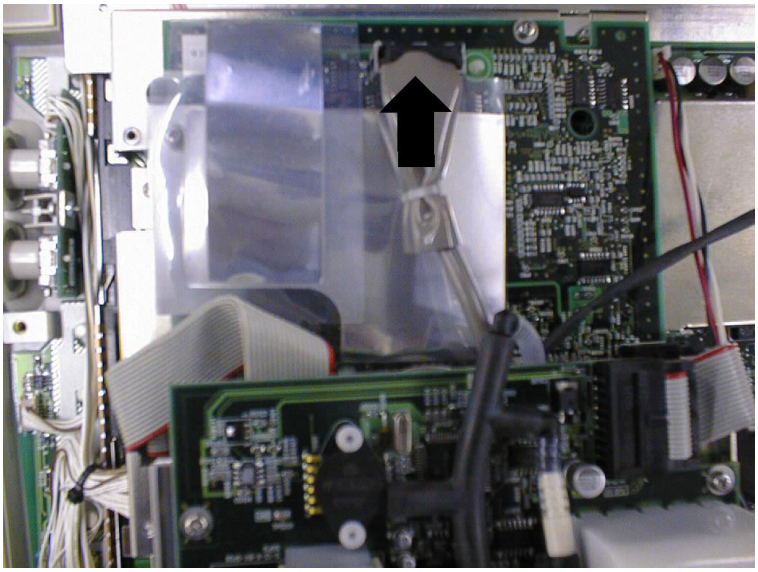


Removing the Nellcor SpO_2 Module (MP304*)

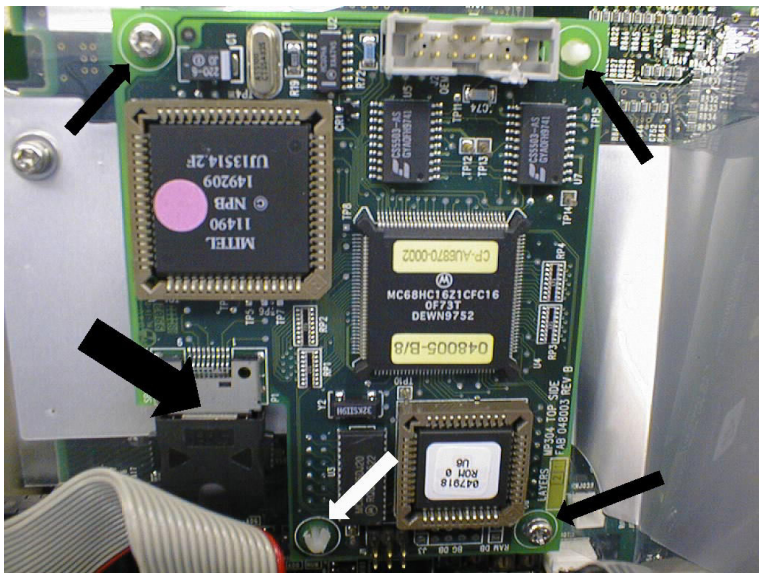
*** When the MP304 SpO_2 module is built in, there is no indication of "NELLCOR OxiMax". Refer to page 1.20 "On the BSM-4102/4104/4112/4114 Monitors".**

Perform the following procedure after the "Opening the Instrument" procedure.

1. Disconnect the connection cable (MP304 J2) marked with an arrow from the SpO_2 module. Open the shield sheet which covers the SpO_2 module.



2. Remove the 2 screws and disconnect the connection cable marked with an arrow from the SpO_2 module. Remove the 2 plastic board retainers from the SpO_2 module with a tweezers. Remove the SpO_2 module.



NOTE in Assembling the Instrument

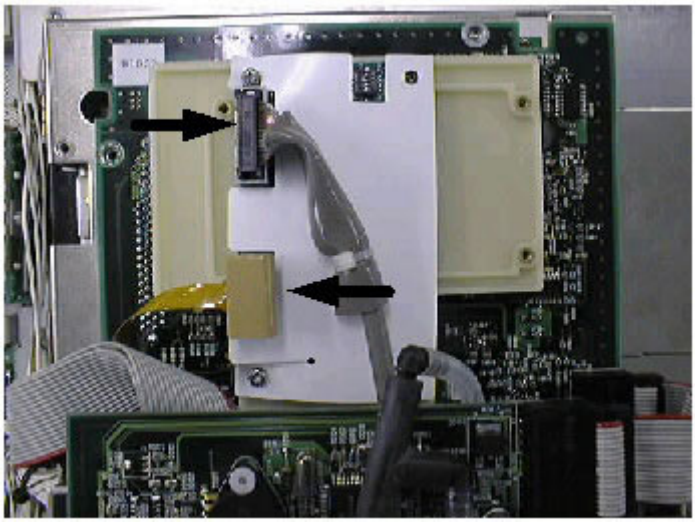
When replacing the SpO_2 module with a new one, remove the 2 jumpers W1 and W2 from the J1 part of the new SpO_2 module.

Removing the Nellcor SpO_2 Module (MP506*)

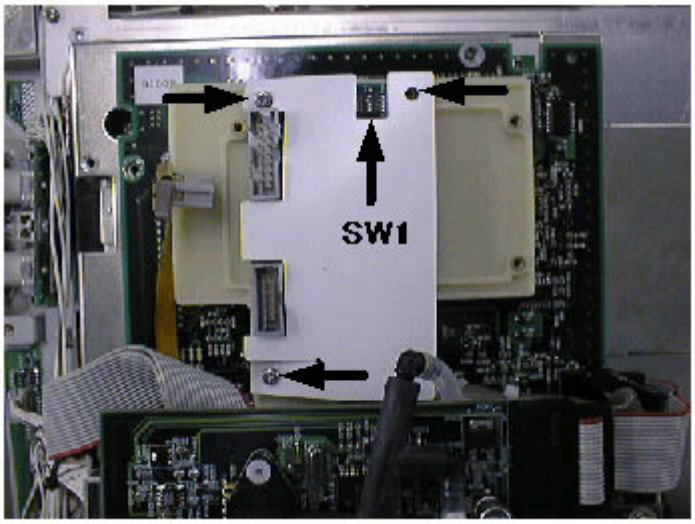
*** When the MP506 SpO_2 module is built in, "NELLCOR OxiMax" is indicated below the SpO_2 socket on the front panel. Refer to page 1.20 "On the BSM-4102/4104/4112/4114 Monitors".**

Perform the following procedure after the "Opening the Instrument" procedure.

1. Disconnect the 2 connection cables at the J1 and J2 connectors on the MP506 marked with an arrow.



2. Remove the 3 screws which secure the SpO_2 module. Remove the SpO_2 module and insulator from the instrument.



NOTE in Assembling the Instrument

When replacing the SpO_2 module with a new one, check that each bit switch of the SW1 DIP switch on the new board is set as shown below.
No. 1, 2 and 4: OFF
No. 3: ON

Removing the NIBP Safety Board

Perform the following procedure after the “Opening the Instrument” procedure.

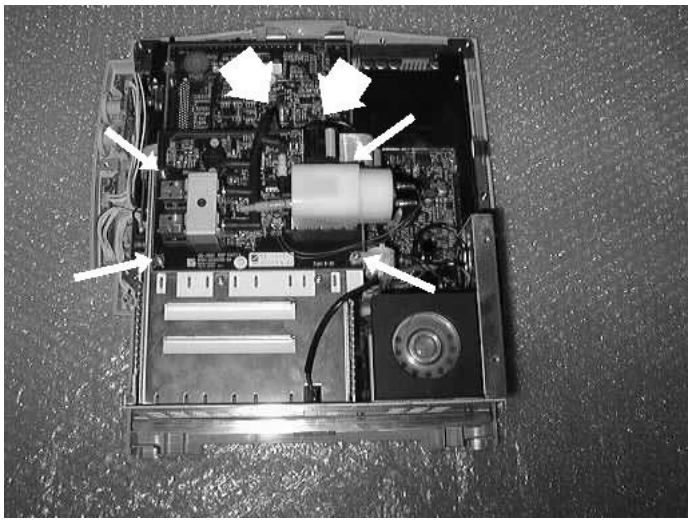
1. Disconnect the air tube from the joint on the NIBP Safety board.

2. Disconnect the cable between the NIBP Safety board and DPU board from the CNJ201 socket on the NIBP Safety board.

3. Remove the 4 screws which secure the NIBP Safety board. Remove the board.

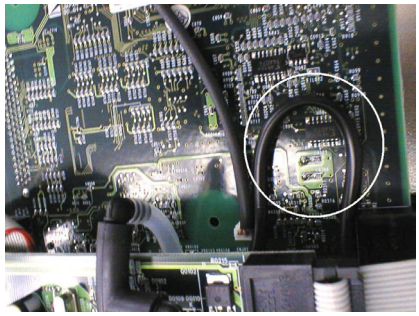
NOTE in Assembling the Instrument

Since the screw which secures the ferrite core for the analog output has a slightly longer shaft and flat washer, be careful not to use the wrong screw for the core.

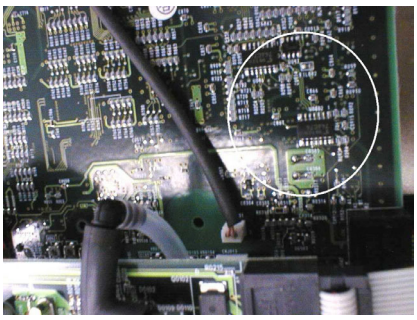


CAUTION in Assembling the Instrument

When you fasten the NIBP Safety board and analog output cable at the ferrite core with the longer shaft screw, do not leave the analog output cable on the three ICs (U802, U096 and U097) of the DPU board.

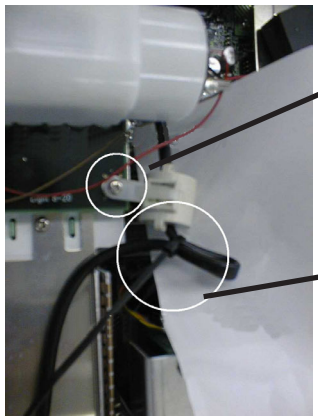


<Wrong>



<Correct>

If the analog output cable is long and it has been left on the three ICs, bind the cable with a cable binder as shown below so that the cable is not left on the three ICs of the DPU board.



The longer shaft screw secures the NIBP Safety board and ferrite core which holds the analog output cable.

The unnecessary part of the analog output cable is bound by a cable binder.

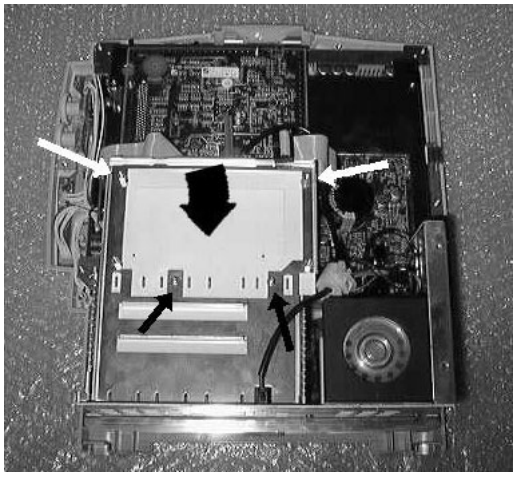
Removing the Motherboard, NIBP Measure Board

Perform the following procedure after the "Removing the NIBP Safety Board" procedure.

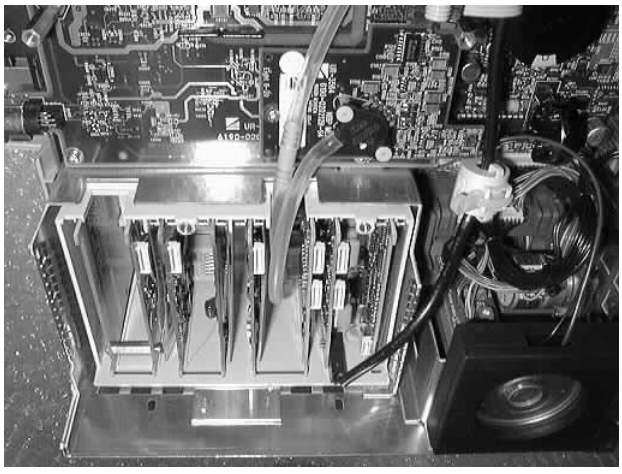
1. Remove the 2 screws and 2 spacer bolts on the motherboard holder as shown below. Slightly tilt the upper part (marked with a thick arrow in the picture) of the motherboard holder and slowly remove it and its insulation sheet to expose the motherboard.

CAUTION

If the motherboard holder or insulation sheet is damaged or the insulation sheet has a hole, it must be replaced with a new one.



2. Slightly tilt the upper part of the motherboard and disconnect the cable connecting to the DPU board from the CNJ701 socket on the motherboard. Slowly remove the motherboard to expose the analog boards and NIBP Measure board.

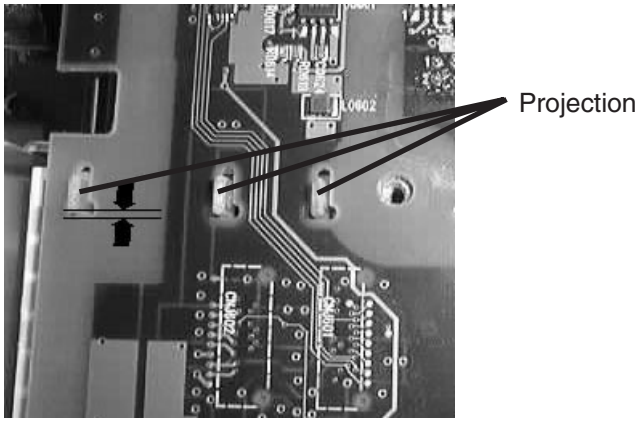


<From the left: MP4, MP3, MP2, MP1, SpO_2, ECG RESP3, ECG RESP2, ECG RESP1 boards>

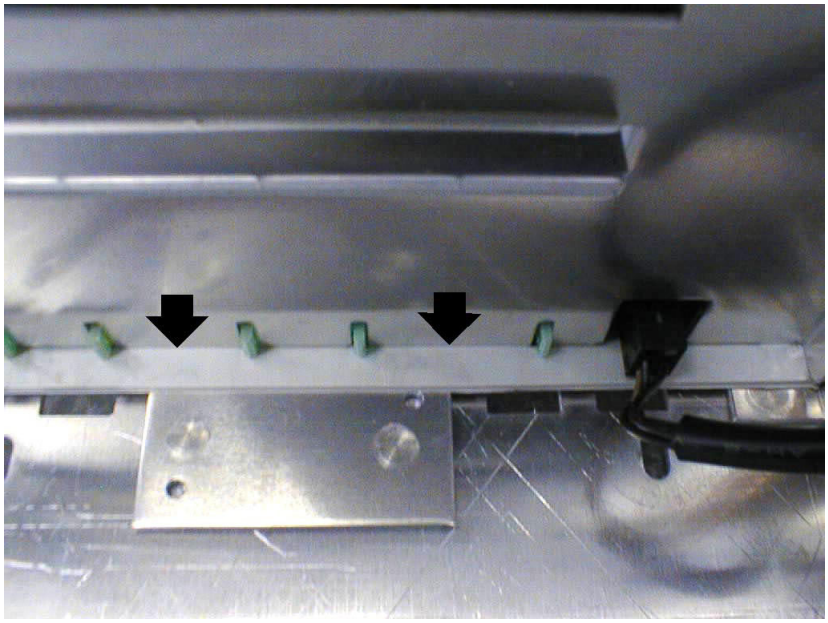
3. Disconnect the air tube from the NIBP Measure board and remove the screw which secures the NIBP Measure board to the DPU board. Remove the NIBP Measure board from the DPU board.

NOTE in Assembling the Instrument

- **To assemble the motherboard and all the analog boards, align the projection bottom edge of each analog board with the bottom edge of the inverted T shape holes on the motherboard (as shown below) so that both side connectors on each analog board and the motherboard can correctly catch each other. Then, depress the area of the connectors, i.e. CNJ601, CNJ602, CNJ401, CNJ301 to 305.**



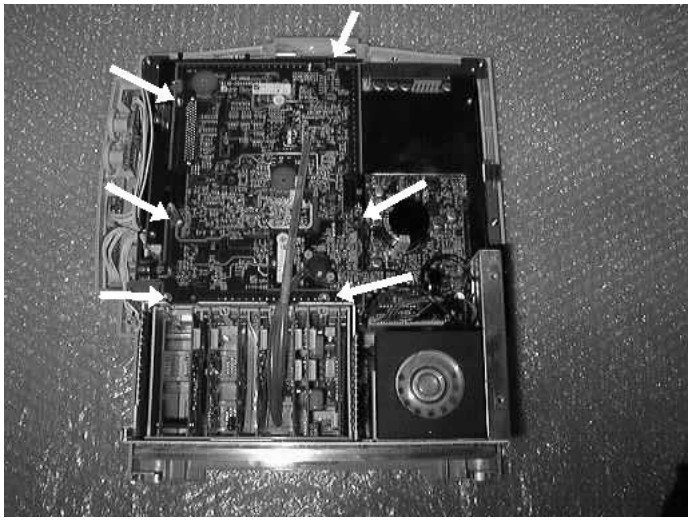
- **Tilt the motherboard holder so that the bottom edge of the motherboard holder can be inserted into the groove of the lower front enclosure. Keep the insertion and lay the motherboard holder on the motherboard.**



Removing the DPU Board

Perform the following procedure after the “Removing the Motherboard, NIBP Measure Board” procedure.

1. Remove the 4 screws and 2 spacer bolts from the DPU board as shown below.



2. Disconnect the analog output cable between the DPU board and ECG RESP2 board from the CNJ013 socket on the DPU board.

3. Remove the DPU board from the DPU board holder.

NOTE in Assembling the Instrument (for BSM-4102A/4112A/ 4104A/4114A)

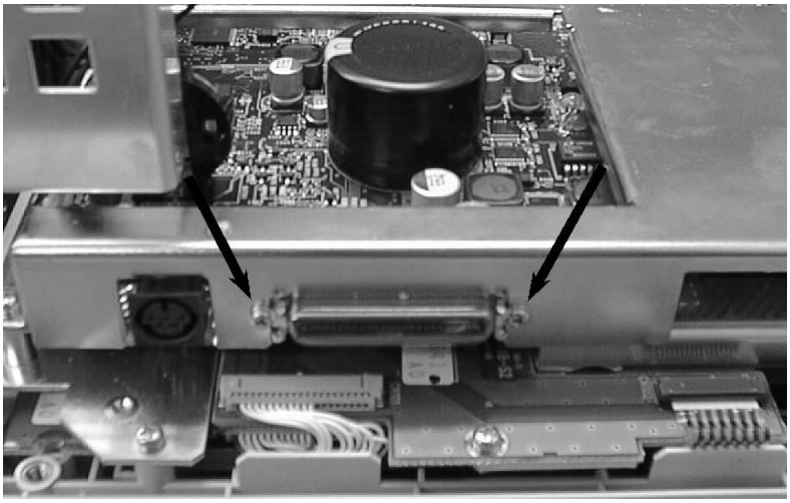
When replacing the DPU board with a new one, check the No. 4 bit switch setting of the SW801 DIP switch on the new DPU board as shown below. The setting depends on the Nellcor SpO_2 module installed in the instrument.

- **No. 4: ON (for MP506 Nellcor SpO_2 module)**
- **No. 4: OFF (for MP304 Nellcor SpO_2 module)**

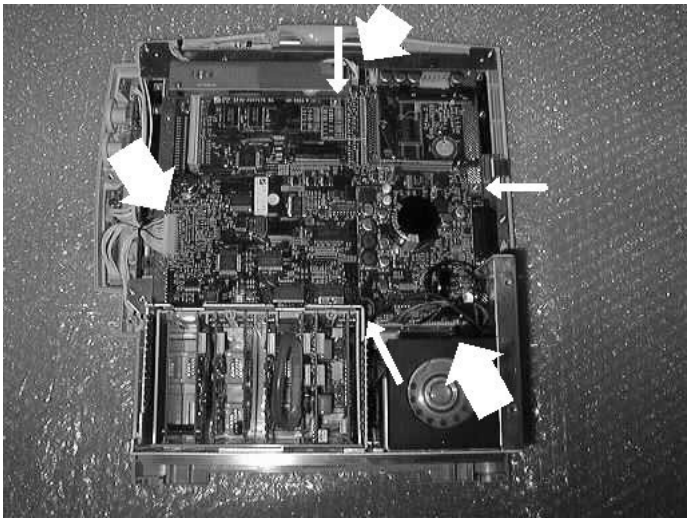
Removing the MAIN Board

Perform the following procedure after the “Removing the DPU Board” procedure.

1. Remove the 2 small screws (PS2.6 x 8) which secure the AUX socket of the MAIN board to the DPU board holder. Remove the 4 screws which secure the DPU board holder and remove it.



2. Disconnect the 6 cables from the CN103, CN108, CN006 and CN121 to CN123 sockets on the MAIN board. Remove the 4 screws which secure the MAIN board and remove it.



NOTE

When the MAIN board is replaced with a new one, set the DIP switch (SW001) on the new MAIN board as follows:
Recorder built-in type (BSM-4101/4102/4103/4104): Set Bit 3 to off.
No recorder type (BSM-4111/4112/4113/4114): Set Bit 3 to on.

Removing the Analog Boards

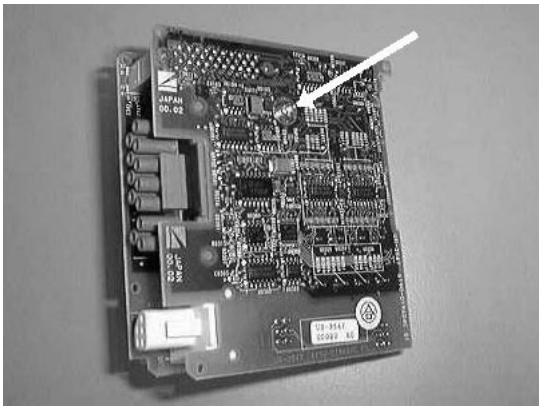
Perform the following procedure after the “Removing the Motherboard, NIBP Measure Board” procedure step 2.

The analog boards are coupled as shown below.

- ECG RESP1 and ECG RESP2 boards
- ECG RESP3 and SpO_2 boards
- MP1 and MP2 boards
- MP3 and MP4 boards

1. Remove the coupled boards from the lower chassis.

2. Remove the pan head screw which combines the two boards as shown below.

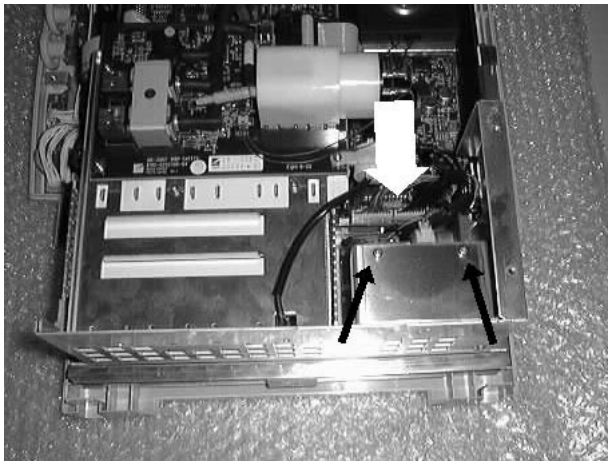


3. Separate the two boards.

Removing the Recorder Unit

Perform the following procedure after the “Opening the Instrument” procedure.

1. Disconnect the 3 cables between the recorder unit and MAIN board from the CN121 to CN123 sockets on the MAIN board.



2. Remove the 2 screws marked with arrows in the above picture.

3. Place the chassis block face up. Pull the paper magazine of the recorder unit upward and remove it.

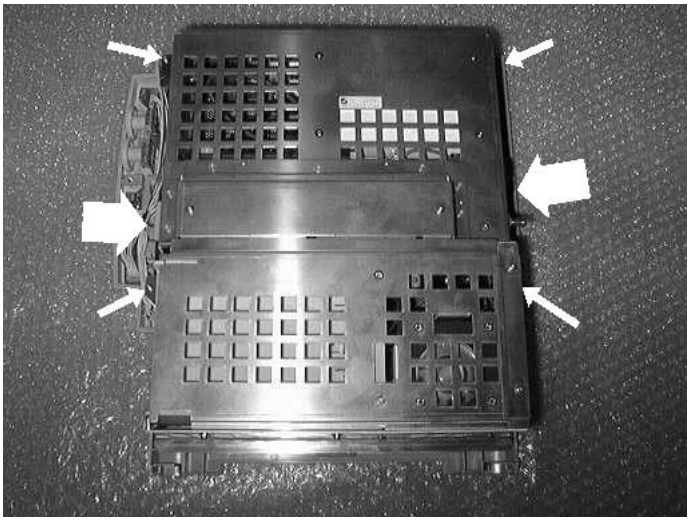
CAUTION in Assembling the Instrument

When attaching the recorder unit to the chassis block, be careful not to pinch or strain the components such as cable and air tube.

Replacing the Touch Screen

Perform the following procedure after the “Opening the Instrument” procedure step 8.

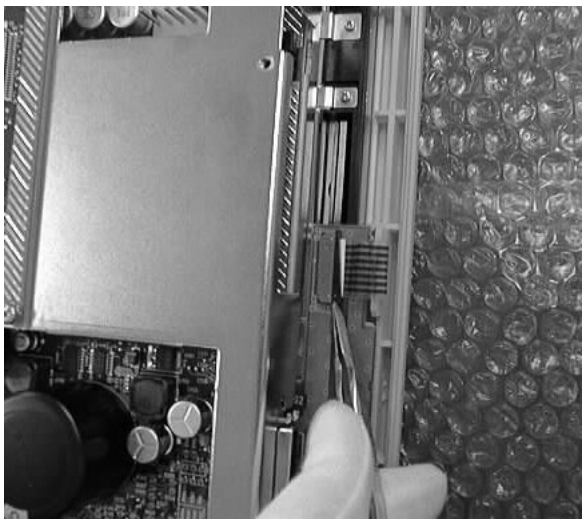
1. Remove the 4 screws which secure the main chassis to the upper front enclosure.



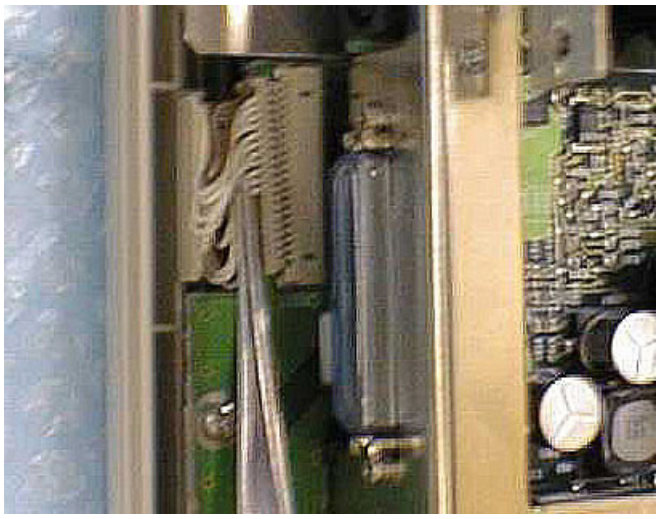
2. Disconnect the touch screen film cable from the connection board.

CAUTION

To disconnect the film cable, pull up the cable stopper of the socket on the MAIN board so that the film cable is set free.



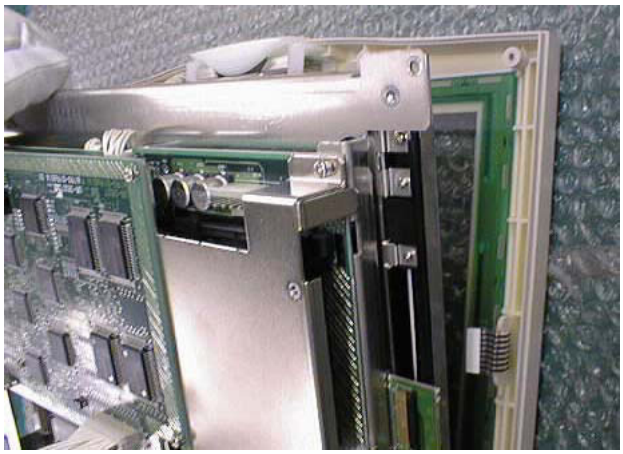
3. Disconnect the cable connecting to the Operation board, Power SW board and alarm indicator board from the MAIN board.



4. Separate the upper front enclosure with the touch screen from the chassis block by slowly setting the chassis block upright.

CAUTION

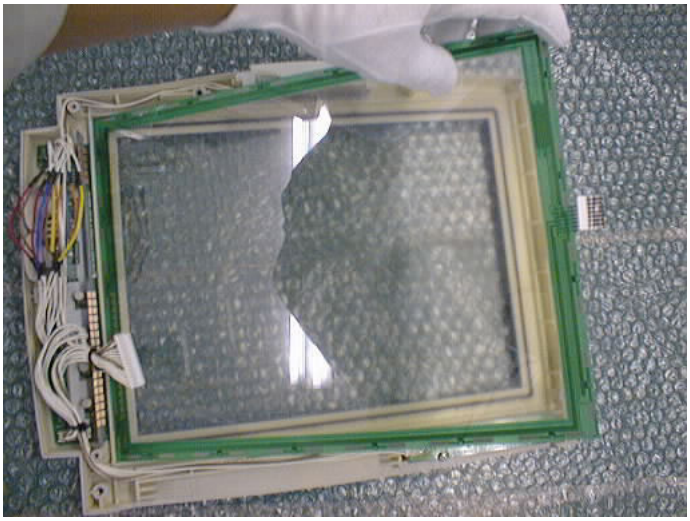
- **Since the touch screen is covered with glass, do not apply excessive mechanical shock such as dropping or pressure to the touch screen.**
- **Pay attention to the sharp glass parts such as the touch screen edges. It can cause cuts and injuries.**
- **If the touch screen is adhered to the LCD unit, carefully peel the touch screen off.**



5. Replace the touch screen and the two long and short packings with new ones. Refer to Section 8 Replaceable Parts List.

CAUTION in Assembling the Instrument

Fit the touch screen onto the original position of the front enclosure. Otherwise, the touch screen will be broken when the chassis block is attached to the front enclosure.



6. Assemble the instrument by reversing the above procedure.

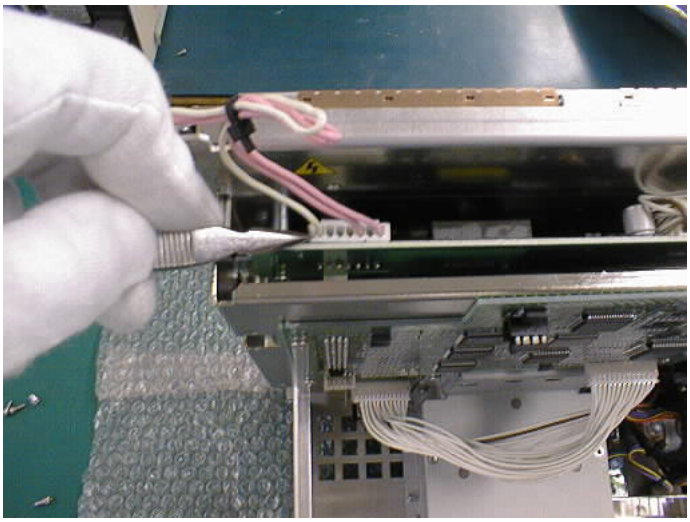
Replacing the Backlight Lamps

Perform the following procedure after the “Replacing the Touch Screen” procedure step 4.

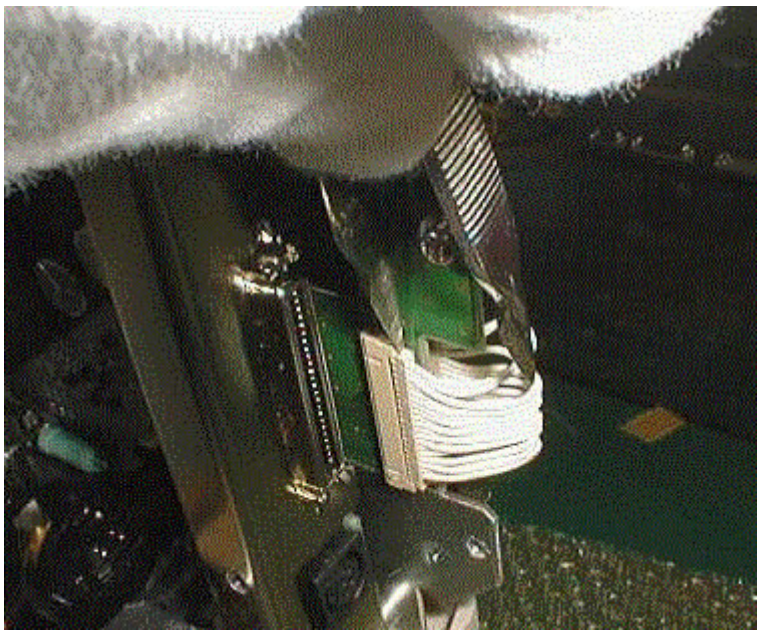
1. Disconnect the cable connecting to the backlight lamps of the LCD unit from the inverter board as shown below.

CAUTION

Be careful not to strain the cable.



2. Disconnect the cable connecting to the LCD unit from the Connection board as shown below.



3. Place the chassis block face up on the table. Remove the 4 screws from the LCD unit as shown below and separate the LCD unit from the chassis block.

CAUTION

- **Since the LCD unit is covered with glass, do not apply a mechanical shock such as dropping or pressure to the LCD unit.**
- **Before placing the LCD unit face down on the table, check that the table is covered with a clean, soft and smooth material to avoid making the screen dirty or damaging the screen.**

4. Place the LCD unit face down on the table covered with a clean, soft and smooth material.

5. Replace the backlight lamps with new ones as follows.

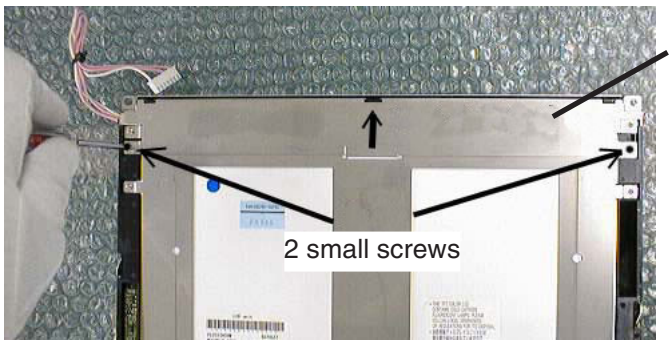
CAUTION

- **Handle the backlight lamp cover carefully because the edges may be sharp and can hurt you.**
- **When removing the 2 old backlight lamps from the holder, use a small tip tool such as small flat-blade screwdriver and carefully insert it between the lamp and holder at both ends. Be careful because the lamp can be easily broken.**
- **Since the lamp is covered with glass, do not apply a mechanical shock such as dropping or pressure to the lamp. If the lamp has a small crack, the gas composition in the lamp will gradually change and the lamp may deteriorate too much in a short period.**
- **Check that the cable between the inverter board and lamps is not damaged. If the cable has even slight damage, it may break the vinyl of the wire and short circuit may occur because a high voltage is output for the lamps through the cable.**

- **Carefully handle the edges of the backlight lamp and cover because their edges are sharp and can cause cuts and injuries.**
- **Discard used backlight lamps (fluorescent tubes) according to your local laws.**

For monitors with revision number before CA

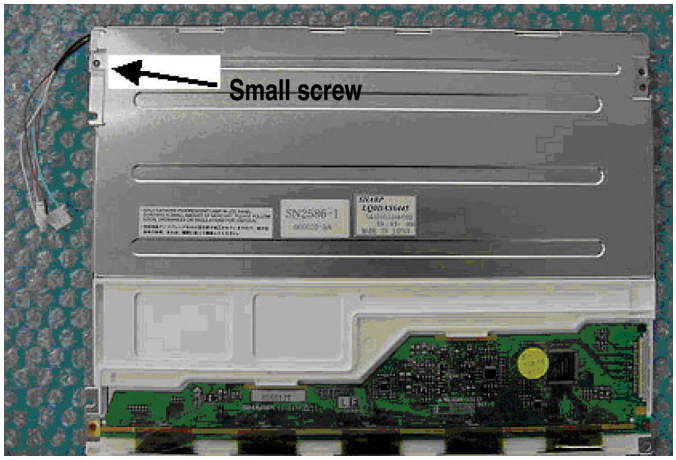
i) Remove the 2 small screws which secure the backlight lamp cover. Slide it outward. 2 backlight lamps are in the holder of the LCD unit.



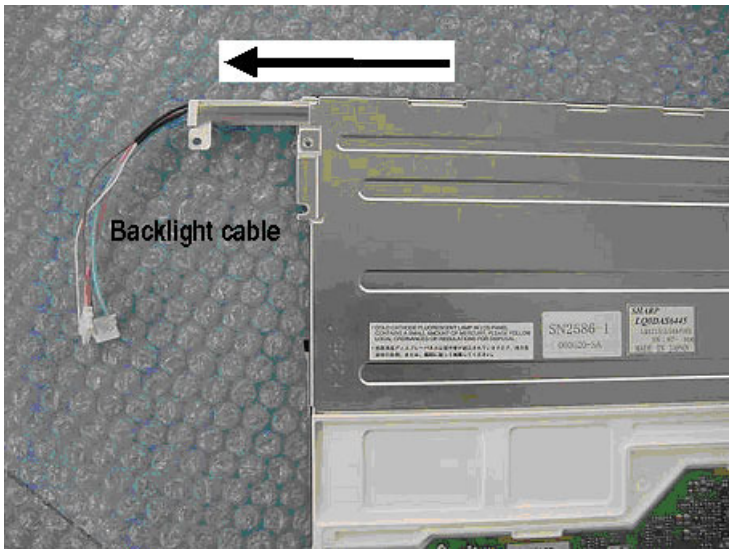
ii) Replace the 2 backlight lamps with new ones.

For monitors with revision number CA or later

i) Place the LCD unit face down on the table covered with a clean, soft and smooth material. Remove the small screw which secure the backlight lamp cover to the LCD unit. Two backlight lamps are in the holder of the LCD unit.



ii) Pull out the backlight lamp by pulling the backlight cable in the direction of the arrow. Replace the 2 backlight lamps with new ones.



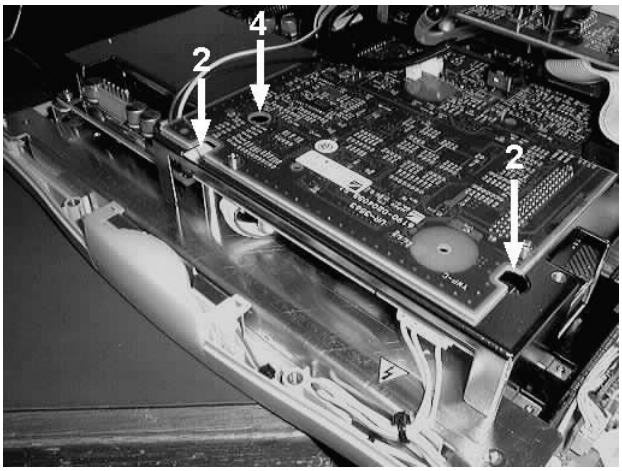
7. Carefully assemble the instrument by reversing the above procedure.

Installing the Options

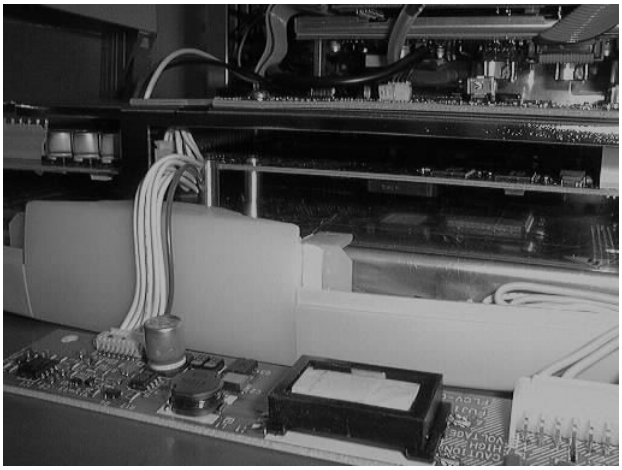
Installing QM-421P Flash Disk Card into the Slot on the MAIN Board

Perform the following procedure after the "Opening the Instrument" procedure.

1. Remove the 2 screws (marked with arrow 2 in the following picture) which secure the inverter board.



2. Pull out the inverter board and put it beside the alarm indicator.



3. Remove the screw (marked with arrow 4 in the step 1 picture) which secure the MAIN board. This screw prevents disconnection of the card.

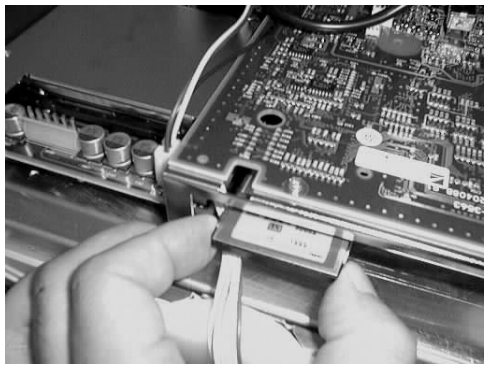
CAUTION

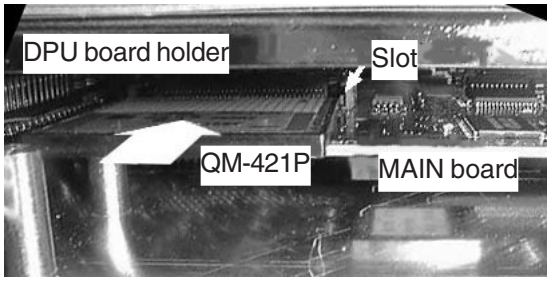
- **Since a high voltage, approximately 600 to 800 V AC, is applied to the cable between the inverter board and LCD unit, you may have an electrical shock if you touch the inverter board within a few minutes after the power is turned off. Wait 5 minutes or more to touch the inverter board after the power is turned off.**
- **Do not scratch or damage the inverter cable with the edge of the chassis or tools.**

4. Insert the card into the card slot on the MAIN board.

CAUTION

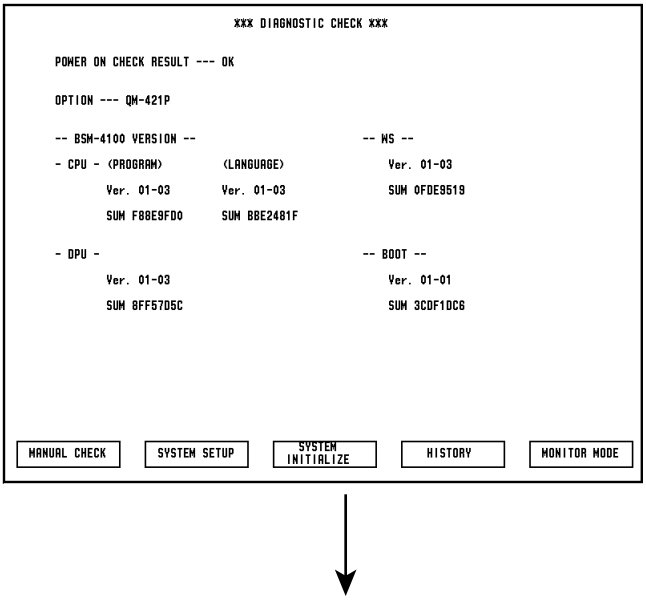
The slot is hard to see. To correctly install the card into the slot, keep the card parallel to the slot while slowly inserting it. Otherwise, pin(s) of the slot may be bent or broken.

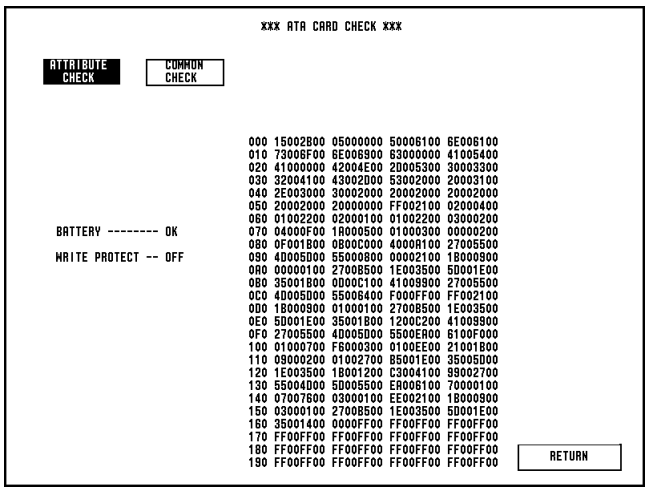


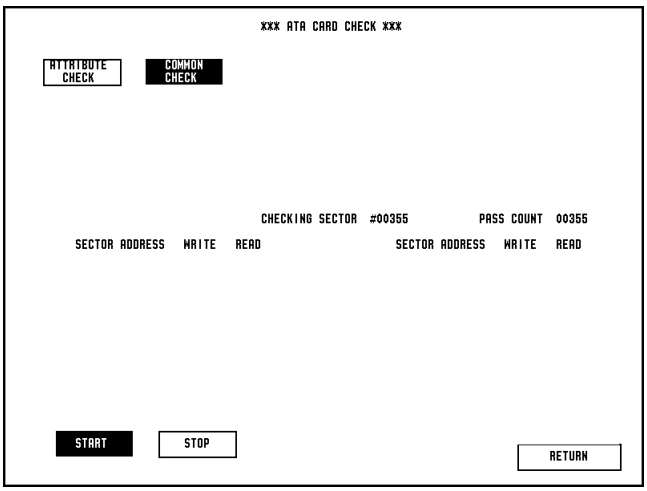


5. Carefully assemble the instrument by reversing the above procedure.

6. Perform the ATA CARD check in the manual check to check the card function. Refer to the Section 3 Diagnostic Check.




xxx ATA CARD CHECK xxx
ATTRIBUTE CHECK
COMMON CHECK
000 15002B00 05000000 50006100 6E006100
010 73006F00 6E006900 63000000 41005400
020 41000000 42004E00 2D005300 30003300
030 32004100 43002D00 53002000 20003100
040 2E003000 30002000 20002000 20002000
050 20002000 20000000 FF002100 02000400
060 01002200 02000100 01002200 03000200
070 04000F00 1R000500 01000300 00000200
080 0F001B00 0B00C000 4000A100 27005500
090 4D005D00 55000B00 00002100 1B000900
0R0 00000100 2700B500 1E003500 5D001E00
0B0 35001B00 0D00C100 41009900 27005500
0C0 4D005D00 55006400 F000FF00 FF002100
0D0 1B000900 01000100 2700B500 1E003500
0E0 5D001E00 35001B00 1200C200 41009900
0F0 27005500 4D005D00 5500EA00 6100F000
100 01000700 F8000300 0100EE00 21001B00
110 09000200 01002700 B5001E00 35005D00
120 1E003500 1B001200 C3004100 99002700
130 55004D00 5D005500 ER006100 70000100
140 07007B00 03000100 EE002100 1B000900
150 03000100 2700B500 1E003500 5D001E00
160 35001400 0000FF00 FF00FF00 FF00FF00
170 FF00FF00 FF00FF00 FF00FF00 FF00FF00
180 FF00FF00 FF00FF00 FF00FF00 FF00FF00
190 FF00FF00 FF00FF00 FF00FF00 FF00FF00
BATTERY -------- OK
WRITE PROTECT -- OFF
RETURN


xxx ATA CARD CHECK xxx
ATTRIBUTE CHECK
COMMON CHECK
CHECKING SECTOR #00355
PASS COUNT 00355
SECTOR ADDRESS WRITE READ
SECTOR ADDRESS WRITE READ
START
STOP
RETURN

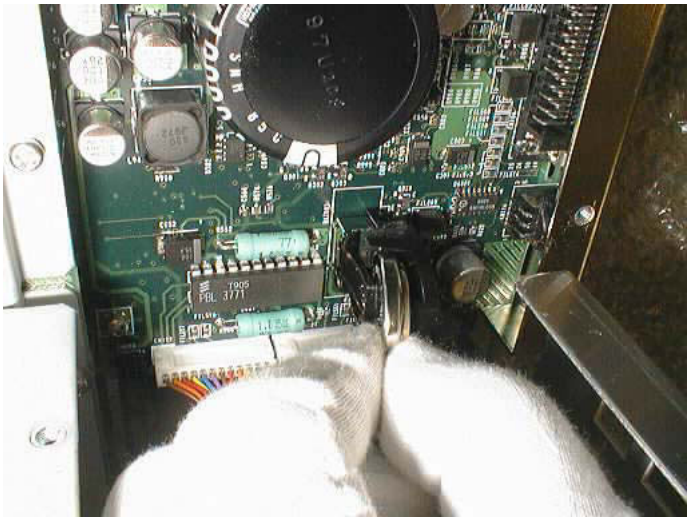
Replacing the Lithium Battery

Perform the following procedure after the “Removing the DPU Board” procedure.

CAUTION

- **Use a glove to handle the new lithium battery. If you touch it with your bare hand, it may cause an increase of resistance at the battery terminals and shorten the lifetime.**
- **Never charge, short-circuit, disassemble, deform, heat, or throw the battery into fire. This may cause overheating, explosion, or fire.**
- **Before disposing of the battery, cover it with insulation tape to prevent short circuit between the positive and negative terminals. Otherwise, the battery may heat, explode or burn if the battery is disposed of with other batteries or electrically conductive materials.**
- **Discard used batteries according to your local laws.**

1. Replace the lithium battery on the MAIN board with a new one as shown below.



2. After the battery replacement, check the continuity between the battery terminal and receptacle terminal with a multimeter or digital voltmeter.